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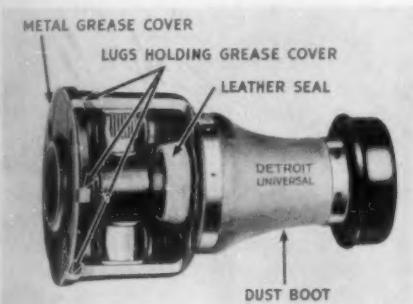
Detroit Universal Joints

A COMPLETE BUT SHORT STORY OF THE CONSTRUCTION*
AND PROPER CARE OF NEW AND OLDER TYPES

By P. E. MIQUELON—Universal Products Co., Detroit, Mich.

Every unit and part used in connection with automobiles is constantly being improved in design. Some of these improvements apply to parts that the average car owner seldom knows about, yet they are of vital importance to him as a car owner.

For example, year after year the construction and design of universal joints have been constantly improved to a point where their failure, due to lack of lubrication, or due to over-lubrication, is almost impossible.



LATEST DESIGN OF DETROIT BALL AND TRUNNION TYPE UNIVERSAL JOINT

I believe, therefore, that a description of our latest designs of Detroit universal joints would be of general interest to all service stations and car owners.

For many years the Detroit Ball and Trunnion type of universal joint has been used on certain models of Chrysler, Graham, Hupmobile, Plymouth, Dodge, Oldsmobile, De Soto, Bantam, Willys, Auburn and Reo cars.

Previous to 1937, this type of joint was provided with a grease plug which needed to be removed for replenishing the lubricant approximately every 10,000 miles. Starting in 1937, the grease plug has been omitted and joints are now packed at assembly by the manufacturer for the life of the car. However, if for any reason it becomes necessary to relubricate, remove the propeller shaft assembly from the car, then remove the metal grease cover at the end of the joint housing by bending up three of the locking lugs, permitting this metal cover to be slipped off sideways from the joint housing. Apply about 1 1/4 oz. of heavy, long-fiber Universal Joint Grease to the ball trunnion, replace cover, and reassemble shaft. A less viscous lubricant should not be used.

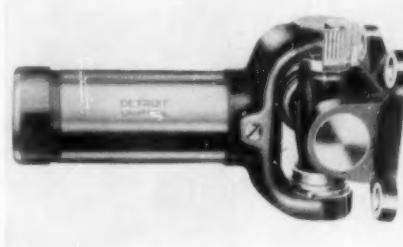
Care should be taken that the ball and trunnions are not forced out through the end of the joint housing while applying the lubricant, as this would permit the roller bearings to fall out. If inspection reveals that there is dirt, water, or other foreign matter in the joint, ball and rollers, it should be disassembled, but only by an authorized dealer or a competent mechanic who is equipped to handle this work.

On the latest design of Ball and Trunnion type joint a cone-shaped leather seal is provided, which prevents the lubricant from working back into the leather dust boot between the joint housing and propeller shaft.

The latest design and construction of the Detroit Cross Type universal joint is used on various models of Packard, Chrysler,

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Hupmobile, Pierce-Arrow, De Soto, Oldsmobile and Reo cars. The cups retaining the roller bearings are packed with lubricant at assembly by the manufacturer, for the life of the car. If necessary to relubricate, a good grade of Wheel Bearing Grease is recommended. However, it is necessary to completely disassemble the unit to lubricate and this should only be done by an authorized dealer or by a competent mechanic who is equipped with the necessary tools to do the job properly. On larger



LATEST DESIGN OF DETROIT CROSS TYPE UNIVERSAL JOINT

cross type joints used on trucks, a fitting is provided in the center of the cross for periodic lubrication.

The spline on cross type joints is lubricated by removing the grease plug and substituting a pressure gun fitting, which should be replaced by the original plug after servicing with Chassis Lubricant. This should be done at intervals of approximately 1,000 miles.

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Technical Data

PRECISION-KNOOP CONSADOMETER

"The development of new motor oils and fuels has kept pace with the advancement in the automotive field. Much scientific study has been devoted to these products and considerable thought given to scientific test methods and apparatus for their classification.

"The A. S. T. M. Standards bulletin lists many standard or tentative methods covering oils, and gasoline, whereas practically no tests are provided for lubricating greases. One is brought to a realization of this fact when the eighteen methods for oils, the ten for gasoline and the nineteen methods for bituminous products are contrasted against the three covering greases, of which only one has to do with the measurement of physical properties.

"Tentative Method D 217-33T attempts to measure the consistency of a grease by noting the depth to which a metal cone of specified shape and size penetrates the sample during a period of five seconds. Due to the shape of the plunger, penetration depths are greatly influenced by the viscosity of the mineral oil content, hence the readings are combinations of viscosity and consistency. Many laboratories have realized the inadequacy of this method and feel that it is of very little value beyond its use as a control instrument in the manufacture of an established product.

"One of the greatest faults with this method lies in the fact that the consistencies of two grease samples, or the worked and unworked samples of the same grease, cannot be expressed in a numerical ratio. All that one can learn in comparing two penetration readings is that one sample is heavier than the other by a certain difference in penetration. This gives one only a small conception of the actual grease consistencies, as may be obtained by the 'finger touch' method, and does not show at all, what percentage the one consistency is in relation to the other.

"As an example of the foregoing fact; two samples of No. 4 Cup Grease may have a penetration of 150 and 155, respectively. This difference of 0.5 mm. (less than 0.02") is often exceeded in many tests, due to uneven surfaces or non-uniformity of samples. Although the two samples appear to possess approximately the same penetration, one is actually 17 to 18% heavier than the other in consistency as measured in force units which can be expressed in percentage. For harder greases than No. 4 Cup Grease experimental errors may be as high as 30 or 40% regardless of the efforts of the operator.

"With greases of 430 penetration (with

entire cone submerged in 5 seconds) the same difference of 0.5 mm. represents a difference of only 2.2%, however, other factors involved in the testing of such light greases produce errors of undesirable proportion. Much more can be said against the Cone Method but to dwell further on the subject would be wasted effort unless a better method can be presented.

"Briefly stated, an ideal instrument for the measurement of consistency should read in force units, because consistency is a resistance to deformation; and resistance can only be properly expressed in grams, ounces or other force units. The plunger, passed



PRECISION-KNOOP CONSADOMETER

through the sample, should be of uniform size and constant shape. It should present the minimum surface area to the grease so as to avoid viscosity effect. The rate of application should be constant for all tests. The temperature of the grease should be uniform throughout the entire sample and be at the standard test temperature within 0.2°F. The size of sample should be large enough to give suitable readings yet not so large that unnecessary time is required to bring the sample to uniform temperature conditions. The machine should be portable, motor driven, automatic in operation, of rugged construction, appealing design, and above all should be universal enough so that many types of tests can be conducted upon it, by the employment of suitable attachments.

"With these points in mind, such an instrument has been developed. The 'Con-

sadometer' is a consistometer, which in addition to measuring consistency also measures adhesiveness and other properties of greases, oils and other materials. Although the 'Consadometer' is of recent development, replacing the old Viscidometer, or 'Spike Test' machine, the various accessories accompanying it are of old standing, having been in use for different tests, some of which were developed twelve years ago.

"Figure I is a photograph of the new Consadometer which may be briefly described as follows:

"The apparatus is portable and of neat design. Enclosed in the base is a constant-speed motor which drives a vertical shaft through an 80 to 1 worm gear reducer. The rotational speed of the turn table, at the top end of the screw shaft, is 20.3 R. P. M. Engagement of a latch in the spline of the left post keeps the turn table from rotating, but allows it to rise at a uniform speed of 8.9 inches per minute. Various attachments for different tests are held concentric by the groove in the table. The forward-and-reverse motor switch is shown at the right hand side of the machine.

"The guide bar, to which is attached the chuck which holds various plungers and other accessories has within the cross head, six guide bearings to keep the bar in correct alignment. The disc just above the chuck limits the travel of the bar (and plunger head) to 0.2" and the dial to two turns of the hand. Thus both the dial and the calibrated pressure head are automatically protected. Four pressure units of 100 grams, 500 grams, 2.5 kilograms and 12.5 kilograms provide a very large capacity range. Inasmuch as each unit can be used to double its capacity (two turns on the dial) the machine may be used with equal accuracy for forces between 25,000 grams and 5 grams; a ratio of 5000:1, which is admittedly greater than ordinarily found in other force measuring devices.

"The table has a total up-and-down travel of 4-1/16", the machine automatically stopping at top and bottom of the given path. A buzzer also automatically sounds when the plunger head is at a point half an inch above and a half inch below the middle of the sample. Each machine is provided with a set of blue prints clearly showing the relative dimensions of the table travel, the various accessories and the adapters which elevate the samples to the proper height above the table so that the buzzing will take place at exactly the proper instant.

"Parts used in the PD (Penetration with Disc) consistency test are the adapter; the PD plunger (1.30" diameter head); a 1 pound sample can (3-3/16" diameter x 4-7/16" high); a stainless-steel reamer for leveling off the sample exactly 9/16" below the rim, thus insuring a definite depth of

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The INSTITUTE SPOKESMAN

Published Monthly by THE NATIONAL
LUBRICATING GREASE INSTITUTE

GEORGE W. MILLER . . . Editor
498 Winspear Avenue, Buffalo, N. Y.

This is the third issue of the INSTITUTE SPOKESMAN in its new form and now that you have had an opportunity to judge the new publication we'd like to have your reaction to it. Your editor is not thin-skinned and will appreciate adverse as well as favorable criticism.

*Car Manufacturers' Latest Recommendations

CADILLAC V-8 (60) — 1938 — Gasoline tank capacity is 22 gal. for this model. Correct tire pressures are 26 lbs. front and rear.

CADILLAC V-8 (60S) — 1938 — Capacity of the gasoline tank used in production of this model is 24 gal. The tire size is 7:00 x 16; correct pressures are 28 lbs. front and rear.

FORD V-8 (60) — 1938 — Some cars are equipped with transmission having capacity of 2½ pt. or lb. instead of 1¼ pt. or lb.

CHRYSLER OVERDRIVE UNITS. Transmission overdrive units on Chrysler cars, starting in 1934, and on De Soto cars starting in 1935, have been provided on many models as either optional or standard equipment. Two types of overdrive units are found, and service instructions differ for each of these. On both overdrive designs, separate drain plugs will be found for the transmission unit and the overdrive unit. However, on one design there is only one filler plug hole for filling both the transmission and overdrive unit, while on the other design individual filler plugs are provided for each unit.

On the design having only one filler plug hole, which is located on the transmission unit, fill the case to level of this plug hole, and allow to stand a while to permit the lubricant to run into the overdrive unit case; then fill again through the same hole to plug level. On this type of overdrive unit there is a large plug hole directly on top of the overdrive unit just under the floorboards, which in some cases has been mistaken for the plug hole through which the overdrive unit should be filled. This plug should never be removed for filling

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(Continued from Page 2)

sample, the thermometer holder which supports one thermometer a half inch from the side of the can and the other at the middle of the sample, the bulbs being about a half inch below the grease level. The thermometers give accurate readings within 0.1°F. The PD test is the standard consistency test for plastic greases or similar materials.

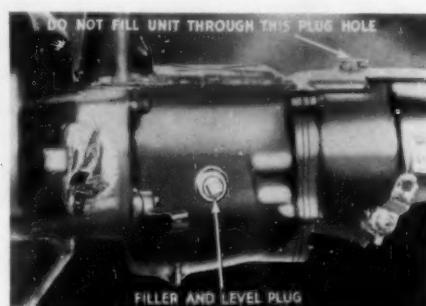
"Equipment used in the PN (Penetration with a Nail) consistency test are a brass test cylinder (7/16" diameter x 1-1/16" high) provided with bakelite insulating jacket and thermometer well; a shallow cup measures the sample and provides a means by which air bubbles, lumps and foreign material can be eliminated. An adaptor known as the PN adaptor is used along

with a cork pusher used in pushing the cylinder down into the sample cup and extruding the sample up through the cylinder bore; a cleaner, nail plunger (5/32" diameter) and finally a special thermometer, accurate within 0.1°F, complete the equipment for PN test.

"The PN test bears a definite relation to the standard PD test, however, the ratio of the one to the other varies slightly with widely differing types of grease. The PN test, requiring less than 3.0 cc for a determination, is necessary when used samples, taken from ball or roller bearings, are to be tested and compared with the original grease. This test is especially valuable in determining the percentage change occurring in the B. E. C. test. The present method requires 20.5 cc sample which seems quite excessive, and often results in much leakage and frequently very little working of the top layer. With this instrument three used samples can be tested, the top, the lubricant in and adjacent to the bearing and the part that leaked through during the test. The standard temperature for both PD and PN test is 70°F (±0.2°F).

"Parts used in Spike (or Viscosity) test are two test jars, one with and one without the bakelite insulating jacket. The jars are constructed like thermos bottles to insure constancy of temperature. Winter gear lubricants and other products on which low temperature data are wanted, are tested at 0°F. (±0.2°F), while Summer lubricants are run at 20°F. using the ¾" and ½" spikes respectively. The thermometer is placed in the one jar while the other contains the undisturbed test sample. The thermometer reads to 0.1°F. The outage reamer and adapter complete the picture. The Spike test is valuable in the determination of consistency at low temperature and also in giving a good indication as to the channeling properties of the lubricant. This is done by withdrawing the plunger from the 'channel-well' one minute after penetration, the material being graded as A, B, C, D, or E. A means excellent fluidity, while E is perfect channel as with petroleum. The head penetrates 1-13/16" at the A buzz, B occurring one inch lower.

"A test cylinder is provided with thermometer wells connected by a vent for the Adherometer which measures adhesiveness of gear lubricants, plastic greases, etc. A metal jar and bakelite jacket are also used. A small disc is provided with a magnet for holding the bullet in place until ready for test. The bullet is .005" smaller than the bore. The resistance offered by the film between the two surfaces is measured and recorded as adhesiveness, but in fact may be regarded as viscosity."



CHRYSLER TRANSMISSION OVERDRIVE DESIGN
WITH ONE FILLER PLUG HOLE ONLY

perienced mechanic is thoroughly competent to provide this service.

STARTING RADI EQUIPPED CARS. Your customers should be cautioned against starting their cars with the radio turned on.

The starter draws a large amount of current from the battery and causes the battery voltage to drop. The voltage may drop to a point where the vibrator becomes inoperative, which may cause the vibrator points to fuse together. Even if they break loose after being fused, reception will probably be noisy and more or less intermittent.

High voltage due to an overcharged battery may also cause the vibrator points to fuse in the same manner as too low a voltage.

A word of caution to your customers plus a periodic check of their batteries will save costly radio repairs and win customer good will for you.

Sales and Merchandising

LUBRITORIUM ADDS TO PROFIT POSSIBILITIES OF STATION

(Condensed from *N. P. N.*)

Possibilities for profits from lubrication service exist at the smaller type service stations, where modern facilities are provided.

The enclosed lubritorium, properly fitted out with modern equipment for car servicing, is not only a place where greasing jobs are done; but also where the car can be driven, away from the atmosphere of hurry around the pump island and thus more time secured to determine the car's actual needs for other services and merchandise the station offers.

It is estimated that not much over 10 per cent of service stations make a determined sales effort to sell lubrication and that, as a result of the oil companies paying less attention to lubrication service in their sales work and advertising than to gasoline sales, the stations today do only 50 per cent of the car lubrication business, whereas a few years ago they had 75 per cent of this business.

In connection with this article there is listed the complete equipment, together with its cost, necessary to give modern lubrication service of the type demanded by competition today, for a one-bay lubritorium operated in connection with an oil company service station. The cost of the building alone to house the lubrication department will vary from \$700 to \$1000, oil companies estimate.

Depreciation and obsolescence on the heavy equipment in the lubritorium is estimated by some companies at 8 per cent and on the lighter equipment at 25 per cent and it is general practice with many companies to charge off the building at the rate of 12 per cent.

With a small station of the type using a one-bay lubritorium, it is estimated that no additional help would be needed, that through the new department, some of the hitherto unproductive labor at the station could be made productive. Half the pay of one man could be charged to the department, or \$40 a month. In addition there would be some increase in the direct operating expense of the station through the lubritorium; more current would be used, more water, cleaning waste and so on. Some companies charge \$5 a month of these direct operating expenses to the lubritorium.

As a rough yardstick of lubrication pos-

sibilities, many companies say the average should be one sale of a chassis lubrication job to the sale of 100 gallons of gasoline. The gross profit to the station on a lubrication job can be taken as 65 cents, the prevailing price charged the customer being 75 cents, of which about 10 cents is cost to the station of the grease used, it is estimated.

On the figure used today of an average of 5000 gallons of gasoline sales a month by oil company service stations, the revenue to the station from the sale of 50 lubrication jobs would be only \$32.50, a long way from meeting the operating costs of the fully equipped modern lubritorium. However, this is not all the story. The sales advantages for other services and merchandise made possible through the operation of the lubritorium would stimulate such sales, in relation to gasoline sales to at least 0.5 cent on each gallon of gasoline sold. On the average of 5000 gallons a month, such sales would add \$25 minimum to the revenue of the lubrication department.

The station would not have to get far above the average of 5000 gallons in monthly gasoline sales before the lubrication department began to show a profit, however. On 6000 gallons a month, its revenue from lubrication sales would amount to \$39 and the minimum from extra sales of other services and merchandise \$30, a total of \$69.

From this point on, as the station's gasoline sales increased or as its percentage of sales of lubrication jobs to gasoline sales increased above the general average, or as its sales of other products and services increased in relation to gasoline sales, the lubrication department's profits would grow.

COMPLETE EQUIPMENT FOR SINGLE BAY SERVICE STATION

1 Lift, full-hydraulic, single piston 10% drive-on type	\$400.00
1 Air-operated lift jack	51.00
1 Two-stage air compressor	255.00
1 Portable chassis lubricating unit, air-operated	98.00
1 Portable gear dispensing unit equipped with meter	98.00

Personal

New Member: Enterprise Oil Co., Buffalo, N. Y.

A MANUAL OF SERVICE STATION MERCHANDISING AND MANAGEMENT. The interest with which this new MANUAL has been received indicates the widespread attention now being given to merchandising throughout our industry.

This MANUAL is attractively bound in black fabrikoid and contains 240 pages with over 100 illustrations and thousands of ideas. Cost \$2.50 for single copies.

Address: National Association of Petroleum Retailers, 342 North Water Street, Milwaukee, Wisconsin.

A meeting of the Board of Directors of The National Lubricating Grease Institute was held at White Sulphur Springs, June 15, in conjunction with the annual mid-summer S. A. E. meeting.

Correction: Lubri-Zol Corp. has been listed as an Associate Member. This is in error. Lubri-Zol Corp. is an active member of the Institute.

1 Portable hypoid dispensing unit, equipped with meter	98.00
4 Hand grease guns for utility, water pump, wheel bearing, fiber universal	41.55
1 Spring sprayer	6.00
1 Penetrating oil gun	1.35
1 Fire extinguisher	12.00
1 Waste can	4.50
1 Spark plug tester and cleaner	20.00
1 Complete kit of small tools	18.50
1 Storage battery cell tester and battery filler	2.00
1 Curb type garage jack	37.50
1 Ceiling reel	40.00
1 Hand type pressure gauge tire inflator	7.50
1 Vacuum cleaner	18.50
1 Air blow gun	2.50
1 Set tire tools	11.30
1 Tire tube tester	3.67
1 Tire tube vulcanizer	10.00
1 Battery charger	32.00
1 Gear flusher	15.00
3 Funnels of different sizes	5.50
3 Oil measures	12.00
1 Portable oil drain	32.50
1 Spring cover lubricator	22.50
Total	\$1356.37

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LUBRICATE FOR SAFETY EVERY 1000 MILES

